

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

PCL0016 – CALCULUS

(ALL Sections/Groups)

03 JUNE 2016

3:00 P.M - 5:00 P.M.

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 3 pages including cover page with SIX questions.
2. Attempt **ALL SIX** questions and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1 (20 marks)

(a) Evaluate the following limits:

(i) $\lim_{x \rightarrow -1} \frac{\sqrt{x+2} - 1}{x+1}$ [4 marks]

(ii) $\lim_{x \rightarrow 0} \frac{\sin x}{e^x - \cos x}$ (Use L'Hôpital's Rule) [4 marks]

(iii) $\lim_{x \rightarrow +\infty} \frac{\sqrt{2x^6 + 3x + 1}}{8x^3 + 2}$ [4 marks]

(b) For what value of a and b is $h(x)$ continuous at every x ?

$$h(x) = \begin{cases} 3 & , \quad x < -1 \\ ax + b & , \quad -1 \leq x \leq 1 \\ 2a - 3bx^2 & , \quad x > 1 \end{cases}$$

[8 marks]

Question 2 (15 marks)

(a) Differentiate $y = \frac{5x + \sqrt{x}}{3x^2 + 1}$ and simplify your answer. [5 marks]

(b) Given $x \cos(y) + x^2 = 1$. Find $\frac{dy}{dx}$ using implicit differentiation. [4 marks]

(c) Use local linear approximation to estimate the value of $\sqrt[3]{126}$. [6 marks]

Question 3 (15 marks)

A car travels on a straight flat surfaced road. Its distance (meters, m) from the origin after time t (seconds, s) is given as $d(t) = 3t - 5t^2 + t^3$.

(a) Calculate the velocity and acceleration after four seconds. [6 marks]

(b) Find the distance travelled between the two points when the velocity is instantaneously zero. [6 marks]

(c) Determine the displacement of the particle when the acceleration is 2ms^{-2} . [3 marks]

Continued...

Question 4 (15 marks)

- (a) Evaluate the following integrals. Simplify your answers.
 $\int 5x^2 \sin 3x dx$ (Hint: Use integration by parts) [8 marks]
- (b) Given the rational function $f(x) = \frac{x+2}{2x^2+x-1}$. By using partial fraction decomposition, it can be written in the following form:
$$f(x) = \frac{A}{(Px-1)} + \frac{B}{(Qx+1)}.$$
- (i) Determine the value for A , B , P and Q [4 marks]
- (ii) Find $\int f(x) dx$. [3 marks]

Question 5 (15 marks)

- (a) A curve is given as $y = 3x^2 - 3$.
- (i) Sketch the curve and shade the region enclosed by the curve and line $y = 6$. [3 marks]
- (ii) Find the area of the regions bounded by $y = 3x^2 - 3$ and $y = 6$. [4 marks]
- (iii) Find the volume if the shaded area revolves around $y = 6$. [4 marks]
- (b) A work of $512J$ is required to move the particle from the origin to a distance of a meters. Find a (meters) if the force $F(x) = 3x^2$ is applied to move the particle. [4 marks]

Question 6 (20 marks)

- (a) Form a first order differential equation from the function $y = x - A \sin 2x$. [4 marks]
- (b) Solve the following differential equations.
- (i) $3y^2 \frac{dy}{dx} + 2x^5 = 1$, $y(0) = 1$ [6 marks]
- (ii) $y'' - y = 0$, $y(0) = 6$, $y'(0) = 4$ [10 marks]

End of Paper